REGD. GOA - 5

Panaji, 10th March, 2000 (Phalguna 20, 1921)

SERIES I No. 50

OFFICIAL GAZETTE

GOVERNMENT OF GOA

EXTRAORDINARY

GOVERNMENT OF GOA

Department of Science & Technology

Goa State Pollution Control Board

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Notification

Goa State Pollution Control Board in performance of its function under Section 17(*a*) & in exercise of its powers conferred under Section 33(*A*) read with Section 41 (*2*) and 49 (*1*) (*a*) of the Water (Prevention and Control of Pollution) Act, 1974 (Central Act No.6 of 1974) hereby notifies "*A comprehensive program for the prevention, control or abatement of pollution of streams and wells in the State of Goa, framed under section 17(a) of the water (Prevention and Control of Pollution) Act, 1974 together with directions framed under section 33-A read with 41(2) and 49 (1)(a) of the said Act*"as under :

PREAMBLE:

1) There is a Writ Petition pending before the High Court bearing No. S.M.W.P.No. 443/98 which has arisen on account of overflowing of soak pit of buildings within the area of Village Panchayat of Santa Cruz with consequential contamination of drinking water of the wells.

2) Directions were issued in that particular case by Hon'ble High Court, but when the Court found that no adequate steps were being taken by the statutory authorities to prevent the overflowing of soak pit giving rise to contamination of water of the wells, the Court desired to know whether there is any policy of the Government to prevent or abate such pollution.

3) The matter was referred by the then Advocate General to the Government pointing out section 17 (*a*) of the Water (Prevention and Control of Pollution) Act, 1974 which enables the Board to prepare comprehensive program for preventing and abating pollution and to issue directions in that regard. The matter was than referred by the Government to the Board.

4) It is on this background the Board put its appearance before the Hon'ble High Court on 27-10-99 and at that time, it was brought to the notice of the Hon'ble High Court that there is already a policy framed by Central Government contained in 'Manual on Sewerage and Sewage Treatment' by Central Public Health & Environmental Engineering Organisation to be followed by all the agencies of the Government Central as well as State and particularly Chapter on Pour Flush Water latrine, and Chapter on Septic Tank and Soak Pit and it was submitted that it was necessary to make some changes to adapt the for local conditions.

5) On the Hearing which took place on 29-11-1999, the tentative guidelines framed by the Board were presented to the Hon'ble High Court. As few changes were required to be made in the draft so submitted, some more time was sought to finalize and to submit the document comprising of comprehensive program and directions to the board for approval and then place before the Hon'ble High Court.

6) *For the above purpose the Board has considered:* a) The provisions of Goa Panchayat Raj Act, 1993 in-particular dealing with sanitation namely section 60 and schedule I, item No. XVIII, and also section 70 and 89.

b) The provisions of Goa Municipalities Act 1968 in-particular chapter XIII dealing with sanitation.

c) The provisions of the Goa Town and Country Planning Act 1974, section 20 dealing with Outline Development Plan.

d) Goa Public Health Act, 1985, section 2 (*16*),18, 20, 21(*1*)(*c*), 23, 30(*a*), 36, 37(*2*), 38 and 113.

7) In the matter of keeping distance between source of drinking water and soak pit, the provisions of the 'Manual on Sewerage and Sewage Treatment', in particular para 21.2.4 providing minimum distance of 20 metres has been kept in mind for drafting executive instructions.

There is no statutory provision providing specific distance, save and except the provisions contained in the proposed Panchayat rule which are at stage of publication which reads as under:

> Rule 45, sub-rule 7(*i*) - 'No water closet or appurittenance which are not connected to a public sewerage system shall be within 15 metres from any well.'

(Draft Rules Notification vide No. 8/DP/GP/BLDGS/ /96, published in Official Gazette, Government of Goa, Series I No. 12, Extraordinary No. 2, dated 23rd June, 1997)

But the delegated legislation has not yet been crystalized into rules. The same proposed rule is some what in consonance with the provisions of para 21.2.4 of the Manual.

The provisions contained in the Article 81 of the Regulation of Buildings which was applicable to entire Goa i.e. all Municipalities and contained in the Legislative Diploma No. 444 dated 14-10-1930 concerning construction of buildings published in the Government Gazette No. 82 dated 15-10-1930, has also been kept in view.

Translation of Article 81 is given below:

ARTICLE 81

> 'No well of drinking water shall be constructed without licence from the respective Municipal Council. It shall be given after the Health Officer is satisfied that in the neighbourhood of the location where the well is intended to be opened there is no latrine, deposit of refuse at a distance which may create a likelihood of contamination and which will depend upon the nature of the soil. Nevertheless, no license shall be given for construction of, referred to in present Article where the distance is less than 10 mtrs. between border of the well intended to be constructed and the nearest point of latrine or of the deposit of refuse'.

8) The Board has taken note that the Government while enforcing the provisions of Goa Non-Biodegradable Garbage (Control) Act, 1996, at first instance it has been extended to all Municipal Councils of Goa, and as far as Panchayats it has been extended to Panchayats of only 3 Talukas viz., Tiswadi, Bardez, Salcete by Notification dated 31-12-1997, No. LS/Misc/1915/96/Part/1309 published in Official Gazette No. 41, Series I, dated 08-01-1998.

The Board proposes to follow similar pattern but extending the area to more Panchayats where the development is in increase and conversely not applying to the Municipalities where such a provision for the time-being appears to be not necessary.

9) The Board has taken note that the Government while extending provisions of the Goa, Daman and Diu, Rent (Building lease, Rent and Eviction) Control Act 1968 (Act No. 2 of 1969) has extended the operation to a belt of 2 kilometres around the limits of the cities as per the notification No. RD/BLDG/77/69-II dated 30-09-1969.

Similar pattern has been followed as far as the Municipal Councils because due to the congestion in the cities, development is spread to the suburbs. However the jurisdiction over the belt, will be of the respective panchayat and not of the Municipal Council.

10) The Board has also noticed that there are statutory provisions included in the Public Health Act, 1985. But there are no rules to give effect to periodical examination for sources of water supply as envisaged section 20 and also there is no record to show that section 38 is given effect to. Most of the provisions of the Act are for abatement of pollution and not of preventive in nature. It is necessary that preventive steps be taken to avoid contamination.

11) It appears that in one of the Writ Petition in the Court in connection of disposal of Garbage, most of the local authorities complaint about lack of funds. But lack of funds does not exonerate the local authorities of complying with statutory obligation imposed on them more so concerning health.

It is of utmost importance that the local authorities make adequate provisions in the budget and acquire necessary equipment and make it functional for the purpose of disludging of septic tanks, as the provisions of the Health Act must be given prominence and this is clear from section 113 of the Public Health Act.

It is reported that at the present only two Municipal Councils namely Margao and Bardez are having the equipments, but some of them are non-functional.

A time frame has been fixed in this regard so that within a specified time, the Municipal Councils will procure the equipment keeping in mind the health of the people and take necessary steps in this regard.

12) The draft comprehensive programme comprising of the technical guidelines and the directions to be issued by the Board, to various concerned authorities, exercising

powers vested with the Board under section 33(*a*) of the Water (Prevention and Control of Pollution) Act 1974 was discussed by the Board at a special meeting held in the Board office on 7-1-2000. After perusal of the document in detail, the Board resolved to approve and adopt the same and authorise Member Secretary to take necessary action to pursue the comprehensive programme.

A COMPREHENSIVE PROGRAM FOR THE PREVENTION, CONTROL OR ABATEMENT OF POLLUTION OF STREAMS AND WELLS IN THE STATE OF GOA, FRAMED UNDER SECTION 17 (*a*) OF THE WATER (PREVENTION AND CONTROL OF POLLUTION) ACT, 1974 TOGETHER WITH DIRECTIONS FRAMED UNDER SECTION 33-A READ WITH 41(2) AND 49 (*1*)(*a*) OF THE SAID ACT.

Introduction:

Supply of drinking water and the safe disposal of domestic waste water are co-related problems, requiring equal attention especially, in the areas where population density is on a steep increase. Where habitations are scattered over large area, the sewage generated from the individual houses can be tackled with application of simple on-site sanitation methods. However, where population density is very high the land area supporting the population is not in a position to take up the excessive sewage load requiring substantial input of technology and funds for tackling the problem. The methodology for collection treatment and safe disposal of sewage requires to be thought over, right from the planning stage.

Classification of the problem areas:

Choice of the sewage handling system depends upon the quantity of the sewage required to be handled. Based on quantitative load of sewage required to be handled, habitations can be classified in three categories:

a. Rural areas
b. Semi urban areas
c. Urban areas

a. The Rural areas are those where the houses are located in scattered fashion with no multi-storeyed buildings. All the census villages shall continue to remain under this category, as long as they are not subjected to intensive construction activities.

b. The Semi Urban areas are the growing housing colonies where number of well defined plots are made to accomodate individual or row houses. There is a tendency to increase permissible floor area and plot area in these Semi urban areas. Areas falling under this category are fast increasing all over the State.

c. The Urban areas are the thickly populated clusters of housing where multi storeyed buildings are constructed side by side. Presently, the permissible floor area and plot coverage in the urban areas are finalized based on commercial consideration only. Floor area ratio above 1 and plot coverage above 60% are the main indicators of urbanization. As per the current trend, the problems related to sewage collection and safe disposal are likely to create alarming situation, in the urban areas unless the projects for providing adequate sewerage facilities are taken up on top priority.

Problems Related to the individual category

a. *Rural areas:* Sanitation problem in the rural areas is basically related to identification of priorities. The Villagers as well as the local authorities are inclined to deny the deserving priority for investment in sanitation.

b. *Semi Urban areas:* Inefficient maintenance of the systems installed for collection and treatment of sewage is the major weakness in the semi urban areas. The problem is aggreviated if construction methods are faulty or design of the system is inadequate.

c. *Urban areas:* In the urban areas, where multi-storeyed buildings are constructed side by side, on-site treatment of sewage cease to be a solution. In such situation, the only scientific solution of the problem is transportation of the sewage through well designed underground sewerage network to a distant location for collective treatment in a properly designed and maintained effluent treatment plant. The ground water in most of the urban areas is getting contaminated with domestic waste due to lack of adequate system for collection, transportation, treatment and safe disposal of the sewage.

Action Plan in a nutshell:

The three stages of action plan are as below:

Stage 1. Identification of appropriate system.

Stage 2. Adoption of suitable construction material and method.

Stage 3. Development of capabilities for timely maintenance.

Stage 1. Identification of appropriate system

a. *Rural areas* - Scientifically designed and properly constructed latrines for the individual houses can tackle the problem in rural areas. Adequate supply of fresh water is one of the necessity for effective working of the system.

b. *Semi Urban areas* - Septic tank and soak pit for the individual houses can be the effective solution. However, this system requires timely maintenance and arrangement for disposal of the solids extracted from the tank during the maintenance.

c. *Urban areas* - The most effective system for urban areas is adequate sewerage network to collect and transport the effluent to distantly located treatment plant. All the residential complexes should necessarily be connected to the underground sewerage system.

Stage 2 - Adoption of suitable construction material and method

a. *Rural areas* - Pour flush latrines constructed for the individual household is the most preferred option in rural areas. Various designs of pour flush latrines suitable for the rural areas are available. The designs incorporated in the 'Manual on Sewerage and Sewage Treatment' are re-produced at *Annexure. 1*

b. *Semi Urban areas* - Septic tank and soak pit for the individual houses is a recommended practice in semi urban areas. Design and construction details of septic tank and soak pits as per 'Manual on Sewerage and Sewage Treatment' are re-produced at *Annexure 2.*

c. *Urban areas* - The design of sewerage system is a subject of professional skill. 'The Manual on Sewerage and Sewage Treatment' brought out by 'The Central Public Health and Environmental Engineering Organization' contains all the relevant information to meet the need of professionals dealing with sanitation sector.

Stage 3 - Development of capabilities for timely maintenance

a. *Rural areas* - Maintenance of pour flush latrines is the primary responsibility of the individual household. The local authority viz. Village Panchayat should supervise the following areas requiring timely attention.

i. Water tightness of inspection chamber, pit cover and leach pit connections.

ii. Pit empting frequencies (interval between successive manual desludgings), depending upon the use of latrines, optimally between 2 to 3 years.

iii. Undisturbed storage of pit contents atleast for one and half year to ensure pathogen destruction and nuisance.

b. *Semi-Urban areas* -Maintenance of septic tank and soak pit require involvement of the local authorities i.e. Municipal Councils or Village Panchayats, though the cost should be borne by the individual household. The effective operation of this system depends upon regular de-sludging and cleaning of the tank. The local authority should be in a position to provide the equipment for de-sludging viz. night soil tankers and sludge pumps at reasonable charges. The sanitary inspector of the local authority should concentrate on the following problematic areas of the system.

i. Adequate ventilation for septic tanks, with ventilation pipe protected with mosquito proof wire net.

ii. Sealing of inspection chambers with water tight covers of adequate strength.

iii. Proper functioning of the arrangement made for absorption of the effluent from the septic tank (viz. soak pit) to avoid stagnation of the effluent on the ground surface.

c. *Urban areas* - Maintenance of septic tank connected to a multi-storeyed building is an extremely difficult task. Frequent de-sludging of the tank and periodic replacement of the soak pit media can minimise the problem of overflowing. However, at the earliest possible, sewerage network should be installed ensuring connection of the drains of all the multi-storeyed buildings to the public sewer.

Maintenance of sewerage collection and treatment system is the responsibility of Public Health Engineering set up under Public Works Deptt. or the local authority, as decided by the Government. The Department in-charge of the maintenance should acquire necessary sewer cleaning equipments compatible with the sewers such as roding machine, scrappers, hydraulic propelled devices, jetting machines, suction units etc. A schedule should be prepared for regular preventive maintenance to avoid break down, blockage settlements or leakage of sewer. The manpower should be trained to handle both preventive and emergency maintenance.

The final effluent after treatment should necessarily satisfy the standards stipulated by the State Pollution Control Board as per the point of disposal viz. streams, estuaries, sea etc. The general standards for discharge of effluent are given in *Annexure 3.*

Agencies requiring re-orientation

1. *Planning Authorities:* Preparation of Outline Development Plan for individual town is the most effective tool in the hands of planners to maintain the population density within the carrying capacity of the infrastructure. Planning & Development Authority and Town & Country Planning Department are the competent agencies for

preparation of ODP. These agencies are required to be re-oriented to the following issues:

i. On-site sewage disposal method is not the competent option for the habitations of high population density. When such methods are employed as stop gap arrangement, no further increase of FAR could be permitted as it would result into further increase in population density, to exert additional load on the already overloaded systems, resulting into its failure.

ii. Designed carrying capacity of underground sewerage network existing/ proposed in a particular area should be the deciding factor in arriving at the permissible floor area, plot coverage and ultimate population density.

iii. The ODP's already approved need to be reviewed for demarcating the place for laying the underground sewerage network and for earmarking location for sewage treatment plant.

iv. A Master Plan which can be the basis for preparation of a programme for providing required infrastructure for collection and safe disposal of sewage, is a primary need of Urbanisation.

2. *Local Authority:* Municipal Councils and Village Panchayats are the local authorities assigned with the basic responsibility of maintaining sanitary conditions in the areas under their jurisdiction. They are required to be re-oriented to the following issues:

i. The officials empowered to issue construction licences on behalf of the Council or Panchayat should be fully conversant with the provisions of 'Manual on Sewerage and Sewage Treatment'.

ii. Within the areas covered by underground sewerage network, the local authorities should ensure that all the house drains are connected to the public sewer.

iii. Providing service of night soil tankers fitted with sewage pumps for de-sludging of septic tanks is primary responsibility of the local authority. For that purpose, all the Municipal Councils should procure suitable equipments either individually or in suitable groups commensurate to the work load, depending upon the population density.

iv. The system of regular checks by Sanitary Inspectors should be re-introduced/intensified especially in the problematic areas, to collect the actual information required for preparation of action plan for preventing maintenance and emergency prepardness.

3. *Public Works Department:* — Since PWD is the agency assigned with the responsibility of planning, construction and maintenance of water supply and sanitation, it is required to be re-oriented to the following facts:

i. Planning for supply of water and disposal of waste water are required to be integrated since on an average 80% of the water supplied comes out as a waste water (as per 'Manual on Sewerage and Sewage Treatment').

ii. Input of funds for urban sanitation should be proportionate to the input of funds for urban water supply. Accordingly, planning should be focussed on preparation of projects for sewerage and sewage treatment for all the urban areas provided with pipe water supply.

iii. The guidelines and specifications compiled by Ministry of Urban Development in the 'Manual for Sewerage and Sewage Treatment' should be methodically followed in planning, designing and maintenance of sewerage network and treatment plants.

4. *Health Authorities:* Monitoring the quality of drinking water is the most important precautionary measure of public health planning. The infrastructure of the Directorate of Health Services should be re-oriented to maintain regular checks on quality of drinking water sources. The practice of periodic checking and dis-infection of drinking water wells by Health Officers of the local area should be re-introduced/intensified for the areas not covered by pipe water supply.

Directions:

Directions issued under Section 33-A read with 41(*2*) and 49(*1*)(*a*) of the Water (Prevention and Control of Pollution) Act, 1974.

1) The Panchayat and its Secretary shall, at the time of issuing license (permission) under section 66 or 68 of the Panchayat Raj Act, 1993 shall:

a) In case of construction of POUR FLUSH WATER SEAL LATRINES, impose conditions of para 21.3.1.3 to 21.3.3.4 of 'THE MANUAL ON SEWERAGE AND SEWAGE TREATMENT' (appended hereto as Annexure -1).

b) In case of construction of SEPTIC TANK AND SOAK PIT impose conditions of para 21.2 to 21.2.4.3 and appendix 21.1 of 'THE MANUAL ON SEWERAGE AND SEWAGE TREATMENT' (appended hereto as Annexure - 2).

c) In particular, as per para 21.2.4 annexure 2, the subsoil dispersion system (such as soak pit) shall not be permitted within 20 mtrs. distance from any source of drinking water. Conversely if there is already subsoil dispersion system no drinking water well shall be permitted to be open without keeping atleast 20 mtrs. distance from such subsoil dispersion system.

d) In terms of para 21.2.3 annexure 2, a condition shall be imposed on the owner of the building that there shall be timely desludging of septic tank.

Explanation:

I) It will be for the concerned local authorities to put the time frame for regular de-sludging of septic tank, taking into consideration the conditions of site and size of the building.

II) It is made clear that the absence of equipment with the local authority does not exonerate the owner of the building from this liability to get the desludging done.

III) However, whenever any local authority, even if the building in question is outside the jurisdiction is approached with a request to provide equipment for desludging, it will be incumbent upon the local authorities so requested to satisfy the request on payment of respective cost.

e) In case of POUR FLUSH WATER SEAL LATRINE, the Sanitary Inspector of the local authority should concentrate on the following areas requiring timely attention:

i) Water tightness of inspection chamber, pit cover and leach pit connection.

ii) Pit empting frequencies (interval between successive manual desludgings), depending upon the use of latrines, optimally between 2 to 3 years.

iii) Undisturbed storage of pit contents atleast for one and half year to ensure pathogen destruction and nuisance.

f) In case of SEPTIC TANK, SOAK PIT the sanitary inspector of the local authority should concentrate on the following areas:

i) Adequate ventilation for septic tanks, with ventilation pipe protected with mosquito proof wire net.

ii) Sealing of inspection chambers with water tight covers of adequate strength.

iii) Proper functioning of the arrangement made for absorption of the effleunt from the septic tank (viz. soak pit) to avoid stagnation of the effluent on the ground surface.

2) The Chief Officer while granting permission for erection of buildings under section 184 of Goa, Daman and Diu Municipalities Act 1968, read with Chapter XIII shall:

a) In case of construction of septic tank and soak pit impose conditions of para 21.2 to 21.2.4.3 and appendix 21.1 of 'THE MANUAL ON SEWERAGE AND SEWAGE TREATMENT' (Annexure 2).

b) In particular as per para 21.2.4 Annexure 2, the subsoil dispersion system shall not be permitted within 20 mtrs. distance from any source of drinking water. Conversely if there is already subsoil dispersion system no drinking water well shall be permitted to be opened without keeping atleast 20 mtrs. distance from such subsoil dispersion system.

c) In terms of para 21.2.3 Annexure 2, a condition shall be imposed that there shall be timely disludging of septic tank.

Explanation:

I) It will be for the concerned local authorities to put the time frame within which regular de-sludging of septic tank shall be done taking into consideration the conditions of the site and size of the building.

II) It is made clear that the absence of equipment with the local authority does not exonerate the owner of the building from his liability to get the desludging done.

III) However, whenever any local authority, even if the building in question is outside the jurisdiction, is approached with a request to provide equipment for desludging, it will be incumbent upon the local authorities so requested to satisfy the request on payment of respective cost.

d) It will be the responsibility of the Municipality to provide labour and equipment for the purpose of desludging and the actual cost and expenditure to be recovered from the owner of the building; and equally to make compulsory provision in the budget for acquisition of such equipment, wherever such provisions has not been made so far, and wherever such equipment is already acquired, see that it is made functional.

Transitory provisions:

As a transitory provision, time of two years is marked to the Municipal Councils to make provisions for procuring the equipment and time of one year to make the equipment functional where it is already available but non functional.

e) In case of SEPTIC TANK, SOAK PIT the sanitary inspector of the local authority should concentrate on the following areas:

i) Adequate ventilation for septic tanks, with ventilation pipe protected with mosquito proof wire net.

ii) Sealing of inspection chambers with water tight covers of adequate strength.

iii) Proper functioning of the arrangement made for absorption of the effluent from the septic tank (viz. soak pit) to avoid stagnation of the effluent on the ground surface)

3. The Planning and Development Authority created under section 18 of the Town & Country Planning Act, 1974 read with section 20 of the same Act, shall:

a) Earmark location for sewage treatment plant and demarcate underground sewerage network in the Outline Development Plans to be made in future and also in the existing Outline Development Plans.

b) Recognize the fact that on-site sewage disposal method, is not the competent option for the habitations of high population density and no further increase of FAR could be permitted while granting permission under section 44 of the Act, as it would result into increase in population density to exert additional load on already overloaded system.

4.The Public Health Engineering set up under Public Works Department or the local authority responsible for maintenence of underground sewerage system as decided by the Government shall acquire necessary sewer cleaning equipments, compatible with the sewers such as roding machine, suction units etc. A schedule should be prepared for regular preventive maintainance to avoid break down, blockage settlement or leakage of sewer. The manpower should be trained to handle both preventive and emergency maintenance.

The final effluent from sewage treatment plant after treatment should necessarily satisfy the standards notified under the Environment (Protection) Act, 1986 as per the point of disposal viz. streams, estauries, sea etc. The general standards for discharge of effluent are given in Annexure 3.

5. The authorities under Public Health Act, 1985 shall keep in mind the provisions of these directions while exercising the powers under the said Act.

6. For the purpose of taking any action under the Water (Prevention and Control of Pollution) Act, 1974 under section 41 (2) for failure to comply with directions issued under section 33 -A in exercise of powers conferred on the Board by section 49(*1*)(*a*) the Board authorises Secretary of the Panchayat, Chief Officer of Municipal Councils and Secretary of Planning & Development Authority to present complaints before the competent Judicial Magistrate First Class under the provisions of Criminal Procedure Code on behalf of the Board.

Explanation:

For the removal of the doubt it is clarified that delegation made as above is in addition of the power given to the Board and the Board may at any time take action regardless of such delegation.

7. The above directions at the first instance shall apply to:

a) Municipal Council of Panaji and a belt of 2 kms. around the boundaries of the Municipal Council but within the boundaries of Taluka and not beyond it.

b) Municipal Council of Mapusa and a belt of 2 kms. around the boundaries of the Municipal Council but within the boundaries of Taluka and not beyond it.

c) Municipal Council of Margao and a belt of 2 kms. around the boundaries of the Municipal Council but within the boundaries of Taluka and not beyond it.

d) Municipal Council of Vasco da Gama and a belt of 2 kms. around the boundaries of the Municipal Council but within the boundaries of Taluka and not beyond it.

e) Municipal Council of Ponda and a belt of 2 kms. around the boundaries of the Municipal Council but within the boundaries of Taluka and not beyond it.

f) Municipal Council of Bicholim and a belt of 2 kms. around the boundaries of the Municipal Council but within the boundaries of Taluka and not beyond it.

g) Municipal Council of Curchorem-Cacora and a belt of 2 kms. around the boundaries of the Municipal Council but within the boundaries of Taluka and not beyond it.

Explanation:

For the removal of doubts, it is clarified that though the directions go upto 2 kms. beyond the boundaries of the Municipal Councils, the jurisdiction on this belt will be of the concerned Panchayat. Similarly, it is clarified that such belt does not extend beyond the boundaries of Talukas, as there is conflict on the interpretation on the notification issued under Goa, Daman and Diu Rent Control Act.

7. The above directions at the first instance shall apply to following Panchayat areas:

a) Of the Taluka of Tiswadi.

i) Panchayat area of Caranzalem
ii) Panchayat area of Santa Cruz
iii) Panchayat area of Bambolim

b) Of the Taluka of Bardez.

i) Panchayat area of Calangute
ii) Panchayat area of Candolim
iii) Panchayat area of Anjuna
iv) Panchayat area of Siolim
v) Panchayat area of Serula
vi) Panchayat area of Pilerne

c) *Of the Taluka of Salcete.*

i) Panchayat area of Colva
ii) Panchayat area of Benaulim
iii) Panchayat area of Utorda

d) *Of the Taluka of Mormugao.*

i) Panchayat area of Baina
ii) Panchayat area of Velsao
iii) Panchayat area of Mobor

8. The other Municipal Councils/Village Panchayats may approach Pollution Control Board to extend the above directions, if they so desire to such area under their jurisdiction, or independent of any such request the Goa State Pollution Control Board may extend the application of the above direction to such areas or other areas if the Board is satisfied that such extension is required.

9. These directions will come into force one month after they are published in the Official Gazette. In addition, they will be circulated to the concerned local authorities through the Director of Municipal Administration, the Director of Panchayats and to the Chief Town Planner.

(F.No. 11/2/99-PCB/(Part)

A. A. Parulekar

Member Secretary
Goa State Pollution Control Board.

Panaji, 8th March, 2000.

ANNEXURE - 1

Ref: Para 21.3.1.3 to 21.3.3.4 of 'The Manual on Sewerage and Sewage Treatment'

Pour Flush Water Seal Latrines

21.3.1.3 Leach Pits

Leach pits serve a dual function of (*a*) storage and digestion of excreted solids and (*b*) infiltration of the waste liquids. Leach pits, are therefore, to be designed on the basis of the following parameters:

a) Solids accumulation rate
b) Long term infiltration rate of the liquid fraction across the pit soil interface
c) Hydraulic loading on the pit
d) Minimum period required for effective pathogen destruction
e) Optimal pit emptying frequency.

The above parameters are discussed below:

a) *Solids Accumulation Rate*

The sludge accumulation rate is a function of a wide range of variables including water table level, pit age, water and excreta loading rates, microbial conditions in the pit, temperature and local soil conditions and the type of material used for anal cleansing.

The leach pit is classified as wet or dry depending on whether the ground water table is above the bottom of pit or below. In dry pits, the pit volume needed is calculated on the basis of solids accumulation rate. But in wet pits though the sludge accumulation rate is lower - the sludge digestion rate is high in the presence of water, yet volume of pit has to be increased to prevent flooding due to surcharge of pits. The sludge accumulation rates given below may be used to calculate the pit volume.

TABLE 21.4

Volume of Leach Pits

Material used for anal cleansing	Pit under dry conditions	Effective Volume in m^3 per Capita per Year*	
		Pit under Wet conditions with successive desludging intervals	
		2 years	3 years
Water	0.04	0.095	0.067
Soft Paper	0.053	0.114	0.080

* Effective volume is the volume of the pit below invert level of pipe or drain

b) *Long Term Infiltration Rate*

On account of clogging of soil pores around the leach pits, the long term infiltration capacity (after clogging) of the soil is always less than the natural percolative capacity. The recommended design values of the long term infiltrative capacity can be derived for typical soil conditions as given in Table No. 21.5

TABLE 21.5

Long Term infiltration rates of different Types of Soils

Sl. No.	Soil Type	Long Term Infiltrative Loading Rate (l/m^2 per day)
1.	Sand	50
2.	Sandy Loam, Loams	30
3.	Porous silty loams, Porous silty Silty clay loams	20
4.	Compact silty loams, Compact silty clay loams, clay	10

c) *Hydraulic Loading*

The hydraulic loading rate is the total volume of liquids entering the leach pit and is expressed in liters per day although it is often more convenient to consider per capita loadings (liters per capita per day). For computing the pit hydraulic loading, wastewater contribution of 9.5 liters per day per person, including water used for ablutions and flushing, urine, excreta etc. can be taken as the basis. The outer surface area (perimeter) of the pit from pit bottom to invert level of pipe or drain is to be considered for infiltration. The pit bottom is not taken into account as it gets clogged in course of time. The infiltration area required is the total flow in the pit per day divided by the long term infiltrative rate of the soil where pits will be located. The infiltrative area of leach pits, sized on the basis of sludge accumulation rate should conform to the computed infiltrative area.

d) *Pathogen Destruction*

After a period of one and half years, almost all pathogens viruses, bacteria, protozoa and helminths-eventually die off in the leach pit or in the surrounding soil, with the exception of Ascaris Lumbriocides (the large human round-worm) - particularly if the leach pit is wet. After about one or one-and-half-years of storage in the pit, it may not be hazardous to handle the contents of the pit for use as manure.

e) *Optimal Pit Emptying Frequency*

The minimum acceptable design interval between successive manual desludging of each twin leach pit could be one and a half years. But to provide a reasonable degree of operational flexibility, it is desirable to provide three years storage volume in urban areas and a two-year period in rural areas.

f) *Size of Pits*

Sizes of leach pits, (designed as per the above criteria, for different number of users, using water ablution and for different sub-soil water levels), with 3 years sludge storage volume, are given in Table 21.6. The surface area of these sizes of pits is adequate, enough for soils with long term infiltrative rate down to 20 liters per sq.m. per day.

TABLE 21.6

SIZES OF LEACH PITS

	5 Users		10 Users		15 Users	
	dia	depth*	dia	depth*	dia	depth*
Dry Pits	900	1000	1100	1300	1300	1400
Wet Pits	1000	1300	1400	1400	1600	1500

* Depth from bottom of pit to invert level of incoming pipe or drain (all dimensions are in mm)

The above depths should be increased by 300 mm to provide a free board depth of pit from invert level of pipe or drain to bottom of pit cover. A typical pour flush latrine with circular pits is shown in Fig. 21.3

g) *Design of Pits under Different Conditions*

In water Logged Area: The pit top should be raised by 300 mm above the likely level of water above ground level at the time of water logging. Earth should then be filled well compacted all round the pits upto 1.0 m distance from the pit and upto its top (Fig. 21.4). The raising of the pit will necessitate raising of latrine floor also.

In high sub-soil water level: Where the sub-soil water level rises to less than 300 mm below ground level, the top of the pits should be raised by 300 mm above the likely sub-soil water level and earth should be filled all round the pits and latrine floor raised as stated above (Fig. 21.5).

In rocky strata: In rock strata with soil layer in between, the leach pits can be designed on the same principle as those for low sub-soil water level and taking the long term infiltrative capacity as 20 liter per sq. m. per day. However, in rocks with fissures, chalk formations, old root channels, pollution can flow to very long distances; hence these conditions demand careful investigation and adoption of pollution safeguards as stated in para below.

In black cotton soil: Pits in black cotton soil should be designed taking infiltrative rate of 10 liters per sq.m. per day. However a vertical fill (envelope) 300 mm in width with sand, gravel or ballast of small sizes should be provided all round the pit outside the pit lining.

Where space is a constraint: Where circular pits of standard sizes cannot be constructed due to space constraints, deeper pit with small diameter (not less than 750 mm), or combined oval, square or rectangular pits divided into two equal compartments by a partition wall may be provided. In case of combined pits, the partition wall should not have holes. The partition wall should go 225 mm deeper than the pit lining and plastered on both sides with cement mortar, (Fig. 21.6).

21.3.2 Construction of Pour Flush Latrine

21.3.2.1 Squatting Pan and Trap

The pan could be ceramic, glass Fibre plastic (GRP), PVC, PP, Cement Concrete or Cement Mosaic. Ceramic are the best but costliest. Mosaic or cement concrete pans have the advantage that these can be manufactured locally by trained masons but the surface tends to become rough after long use. Their acceptance is less compared to other types.

Traps for ceramic pans are made of the same material but of GRP pans. HDPE traps are used for mosaic pans, traps are of cement concrete.

21.3.2.2 Foot-Rests

These can be of ceramic, cement concrete, cement mosaics or brick plastered. The top of the foot rest should be about 20 mm above the floor level and inclined slightly outwards in the front.

21.3.2.3 Pit Lining

The pits should be lined to avoid collapsing. Bricks joined in 1:6 mortar are most commonly used for lining. Locally, manufactured bricks should be used wherever available. Stones

or laterite bricks of cement concrete rings could also be used depending upon their availability and cost. However, for ease of construction, use of concrete rings will be advantageous where the subsoil water level is above the pit bottom.

The lining in brick work should be 115 mm thick (half brick) with honey combing upto the invert level of incoming pipe or drain; the size of holes should be about 50 mm wide upto the height of the brick course. For ease of construction, holes should be provided in alternate brick courses. In case the soil is sandy and sand envelope is provided, the width of openings should be reduced to 12 to 15 mm. Where foundation of building is close to the pit, no holes should be provided in the portion of lining facing the foundation and in rest of the lining, 12 to 15 mm wide holes be provided. The lining above the invert level of pipe or drain upto the bottom of pit's cover should be in solid brick work i.e. with no openings.

The concrete rings used for lining should be 50 mm thick, about 450 mm in height and of required diameter in 1:3:6 cement concrete and have 40 mm circular holes staggered about 200 mm apart. The rings are not jointed with mortar but are put one over the other. The rings above the invert level of pipe or drain should not have holes and are jointed with cemented mortar.

21.3.2.4 Pit Bottom

Except where precautions are to be taken to prevent pollution of water sources, the pit bottom should be left in natural condition.

21.3.2.5 Pit Cover

Usually RCC slabs are used for covering the pits, but depending upon the availability and cost, flag stones can also be used. The RCC Slab may be cast in pieces for convenience of handling and centrally cast.

21.3.2.6 Leach Pit Connection

The toilet pan is connected to the pit through a 75 mm brick channel of 'U' shape covered with loosely jointed bricks or 75 mm dia A.C. or PVC non-pressure pipe laid in 1:15 gradient. In case pipes are used, a chamber of minimum size 225 x 225 mm is provided at the bifurcation point to facilitate cleaning and allowing flow to one pit. In case of drain 'Y' portion of the drain serves the purpose by taking out the brick cover.

21.3.3 Pollution Safeguards

In order that the pollution risk of ground water and water sources in minimal, the following safeguards should be taken while locating the pits.

21.3.3.1 Safe distance from drinking water sources

In dry pits or unsaturated soil conditions, i.e. where the distance between the bottom of the pit and the maximum ground water level throughout the year is 2 M and more.

a. The pits can be located at a minimum distance of 3 m from the water sources such as tube wells and dug wells if the effective size (E.S.) of the soil is 0.2 mm or less, and

b. for coarser soils (with E.S. greater than 0.2 mm) the same distance can be maintained if the bottom of the pit is sealed off by an impervious material such as puddle clay or plastic sheet and 500 mm thick envelope of fine sand of 0.2 mm effective size is provided around the pit.

In wet pit saturated soil conditions, i.e. where the distance between the bottom of the pit and the maximum ground water level during any part of the year is less than 2m.

a. The pits can be located at a minimum distance of 10 m from the water sources such as tubewells and dug wells, if the E.S. of the solid is 0.2 mm of less and

b. For coarser soils (with E.S. more than 0.2 mm), minimum distance of 10 m can be maintained if the pit is sealed off by an impervious material such as puddle clay or plastic sheet and a 500 mm thick envelope of fine sand of 0.2 mm effective size is provided all round the pit.

21.3.3.2 Safe distance from Water Supply mains

Lateral distance between the leach pit and the water mains should be at least 3 m provided the water table does not rise during any part of the year above the pit bottom and the inlet of the pipe or drain to the leach pit is below the level of water main. If the water table rises above the bottom of the pit, the safe lateral distance should be kept as 8 m. If this cannot be achieved, the pipes should be completely encashed to a length of at least 3 m on either side of the pit.

When the pits are located either under the foot path or under the road, or the water supply main is within a distance of 3 m from the pits, the invert of the inlet pipe should be kept at least 1 m below the ground level. This would ensure that the liquid level in the pits does not reach the level of the water main as the water mains are generally laid at 0.9 mm depth.

The water pipe should not cut across the pit, but where this is unavoidable, the water pipe should be completely encased for length of 3 m on either side of the pit including the portion across the pit to prevent infiltration or exfiltration.

21.3.3.3 Location of Pits

The ideal position for locating the pits is that the pits are placed symmetrically at the backside of pan. The pits may be located within premises, under foot path or narrow lanes or under road. The minimum space between two pits should be equivalent to at least the effective depth (distance between the invert level of pipe or drain and bottom of the bit) of the pit, spacing can be reduced by providing an impervious barrier like cut off screen or puddle wall.

In many cases, the space available for constructing leaching pits may be small and placement of pits near existing structure may be unavoidable. The digging of pits and subsequent seepage may disturb the soil around the pits. The safe distance of the leaching pits from the foundations of existing building depends upon the soil characteristics, depth as well as type of foundation of the structure, depth of the leaching pits etc., and varies from 0.2 to 1.3 m.

However, in cases where the leaching pits are quite close to the existing building foundation, the opening in the brick work lining of the leaching pit may be reduced to 12 - 15 mm.

Where the bottom of the pit is submerged below the maximum ground water level:

i) the top of the pits should be raised above the ground level, if necessary, so that the pipe into the pit is at least 0.75 m above the maximum ground water level.

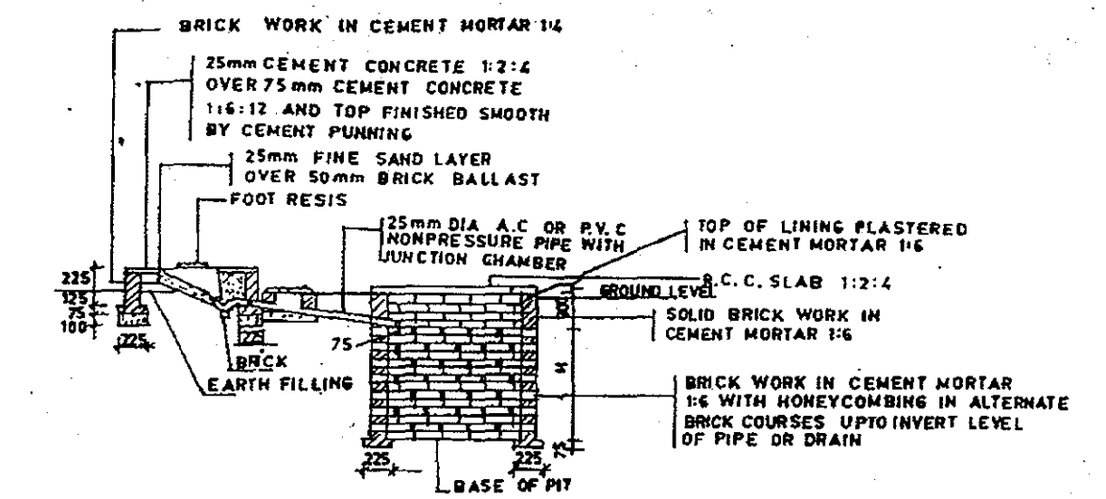
ii) the sand envelope is taken upto 0.3 m above the top of the inlet pipe and confined suitably to exclude any surface drainage including rain water directly entering the sand envelope.

iii) in mound type latrines, 1 m high earth filling be provided at least 0.25 m beyond the sand envelope with the edges chamfered to lead away the rain or surface water and

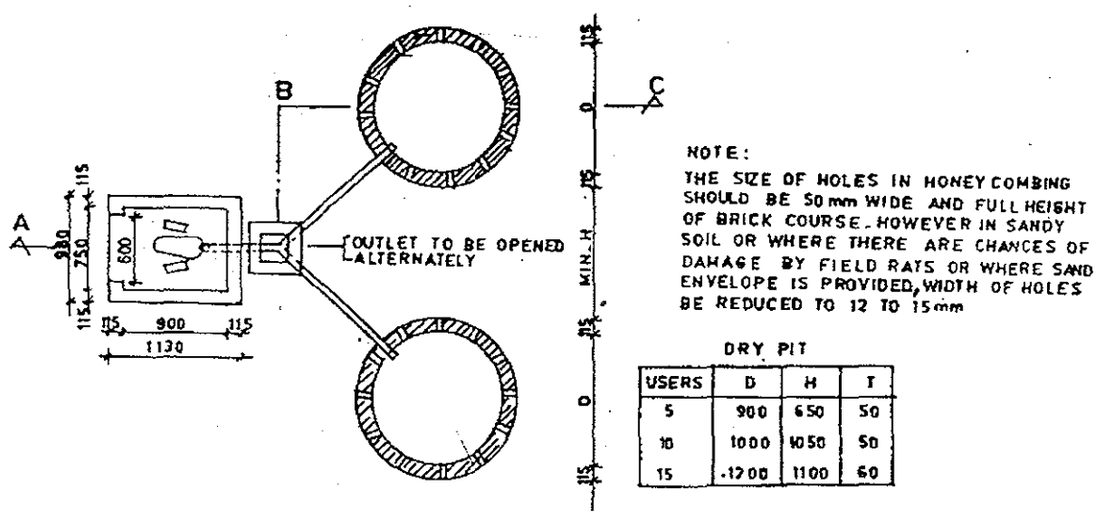
iv) the honeycomb brick work for the pit lining should be substitute by brick work in cement mortar 1:6 with open vertical joints, i.e. without mortar. Where sand is not available economically, local soil of effective size of 0.2 mm can also be used.

21.3.3.4 Sub-soil conditions

In depression and water logged areas location of pits should be avoided, as far as possible, in depression where wastewater or rain water is likely to remain collected all round and over the pits. If, it cannot be avoided or the pits are to be constructed adjacent to ponds or tanks, the top of pits should be raised to 0.6m to 0.8 m above the ground level and earth filling be done all round the pits upto a distance of 1.5 m right upto the pit top. The raising of pit may necessitate raising of the latrine floor also.



SECTION A B C

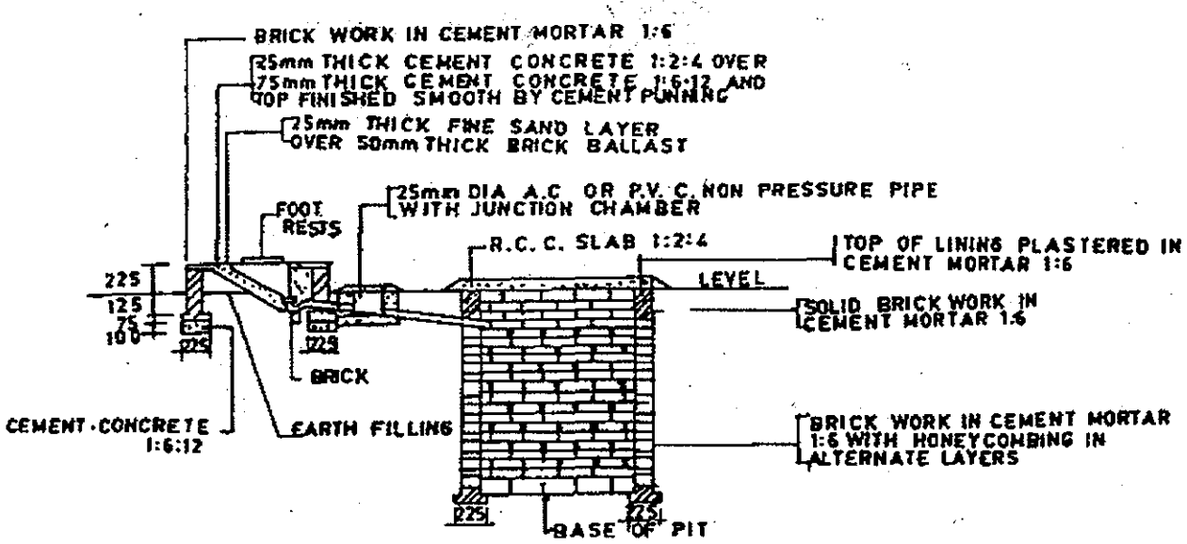


PLAN

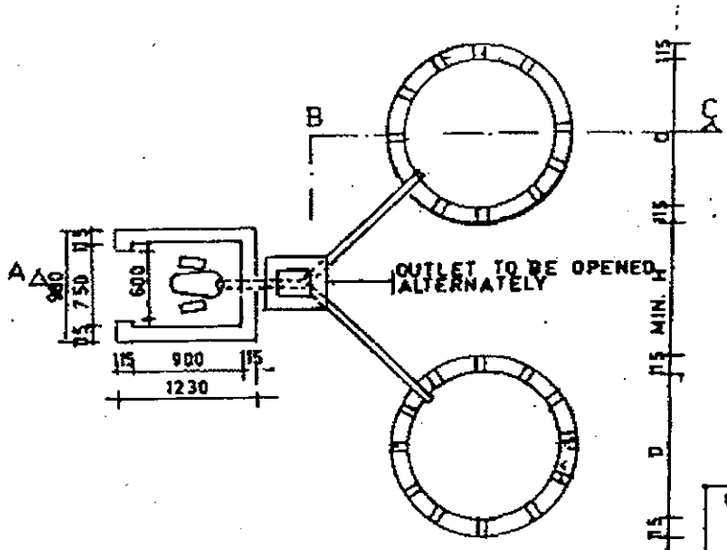
DRY PIT

USERS	D	H	T
5	900	650	50
10	1000	1050	50
15	1200	1100	60

FIG. 21.3(a): POUR FLUSH LATRINE WITH CIRCULAR PITS



SECTION A.B.C



NOTE:
THE SIZE OF HOLES IN HONEYCOMBING SHOULD BE 50mm WIDE AND FULL HEIGHT OF BRICK COURSE HOWEVER IN SANDY SOIL OR WHERE THERE ARE CHANCES OF DAMAGE BY FIELD RATS OR WHERE SAND ENVELOPE IS PROVIDED WIDTH OF HOLES BE REDUCED TO 12 TO 15mm.

WET PIT

USERS	D	H	T
5	900	1250	50
10	1200	1400	60
15	1600	1680	75

PLAN

FIG. 21.3(b) : POUR FLUSH LATRINE WITH CIRCULAR PITS

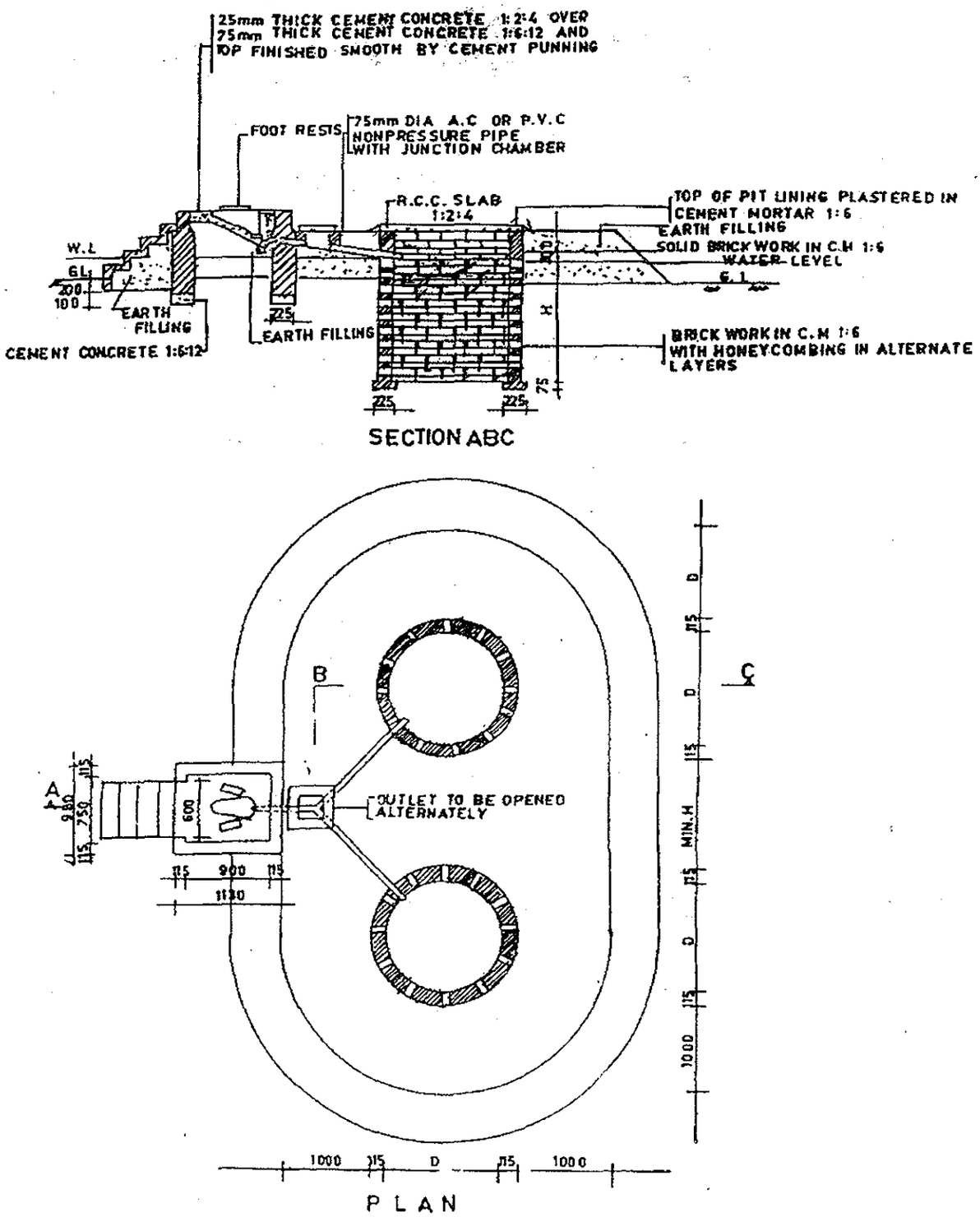
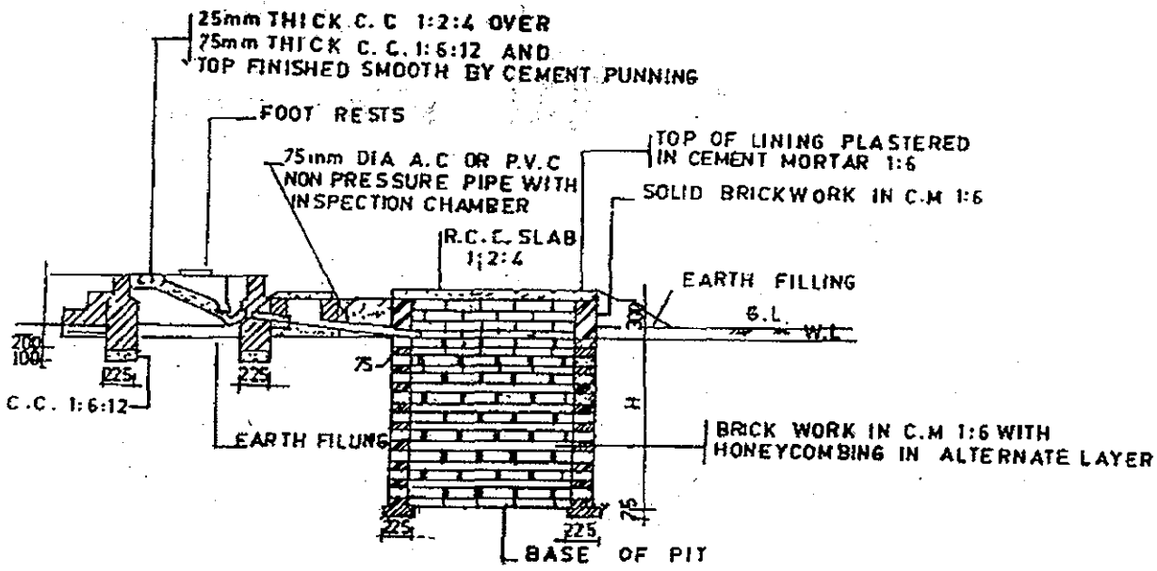
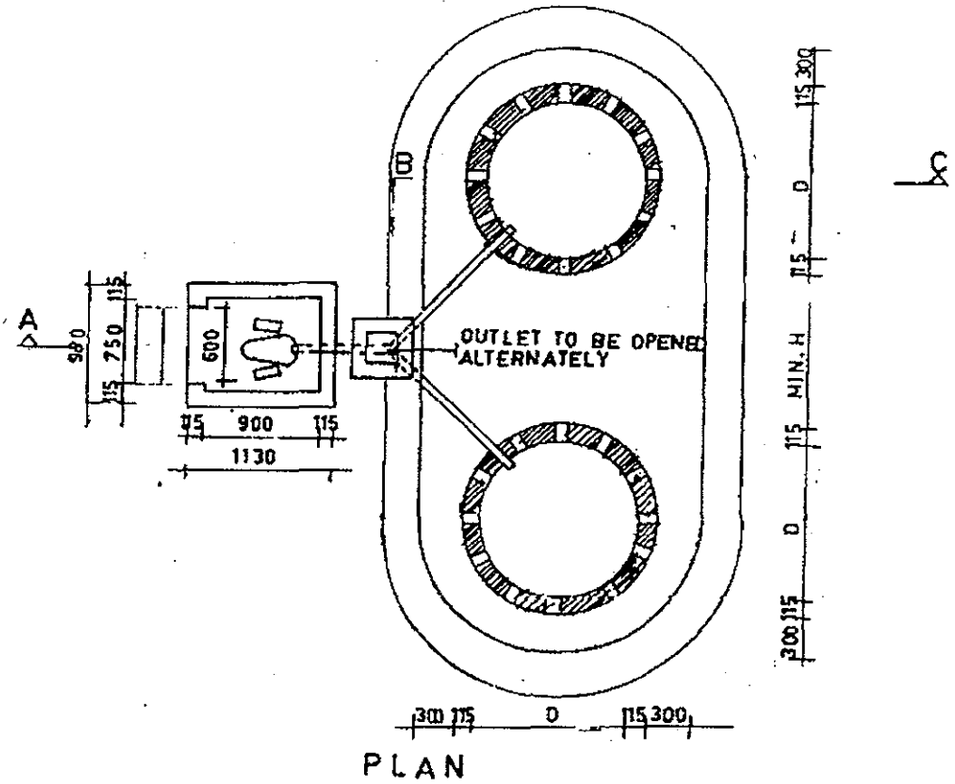


FIG. 21.4 : POUR FLUSH LATRINE IN WATERLOGGED AREAS

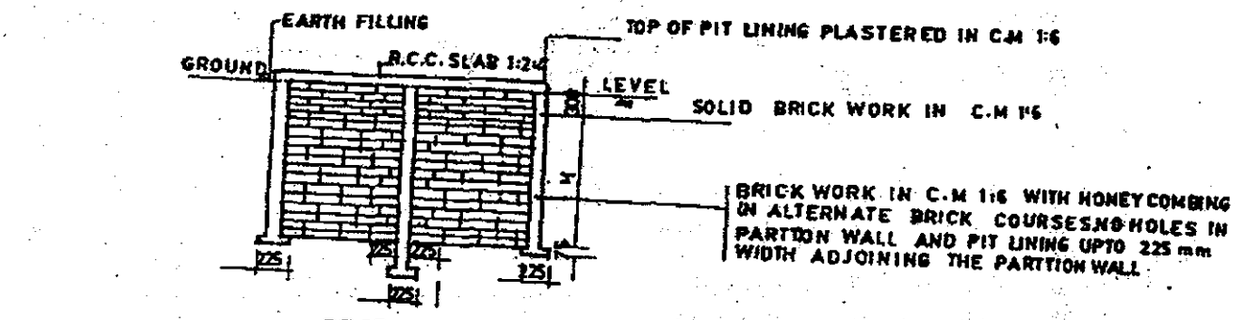


SECTION ABC

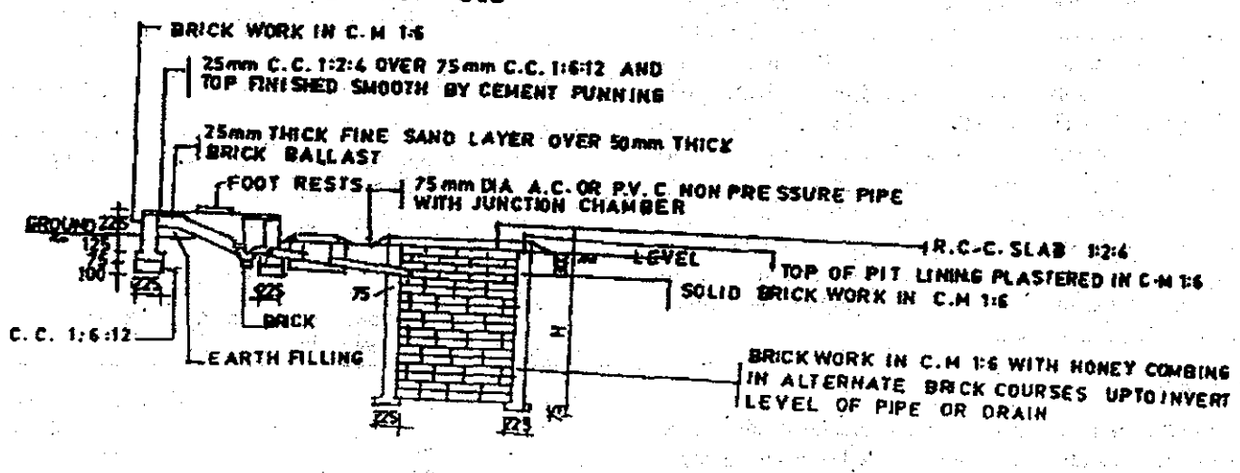


PLAN

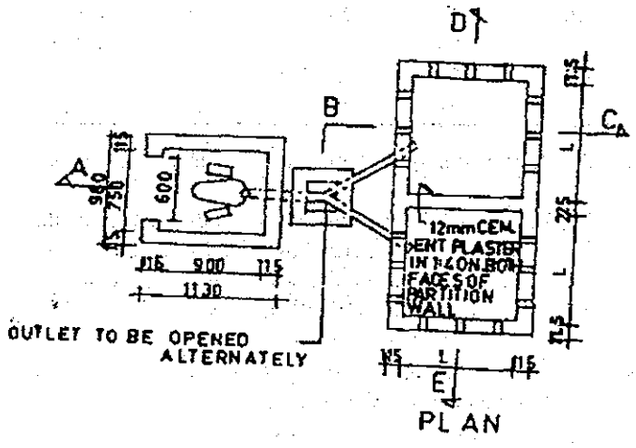
FIG. 21.5 : LEACH PITS IN HIGH SUBSOIL WATER LEVEL



SECTION D-E



SECTION A B C



PLAN

NOTE:

THE SIZE OF HOLES IN HONEY COMBING SHOULD BE 50mm WIDE AND FULL HEIGHT OF BRICK COURSE IN SANDY SOIL OR WHERE THERE ARE CHANCES OF DAMAGE BY FIELD RATS OR WHERE SAND ENVELOPE IS PROVIDED WIDTH OF HOLES BE REDUCED TO 12 TO 15mm

FIG. 246: POUR FLUSH LATRINE WITH COMBINED PITS

ANNEXURE - 2

Ref: Para 21.2 to 21.2.4.3 and Appendix 21.1 of 'the Manual on Sewerage and Sewage Treatment'

Septic Tank and Soak pit

21.2 Septic Tank

A septic tank is a combined sedimentation and digestion tank where the sewage is held for one to two days. During this period the suspended solids settle down to the bottom. This is accompanied by anearobic digestion of settled solids (sludge) and liquid, resulting in reasonable reduction in the volume of sludge, reduction in biodegradable organic matter and release of gases like carbon dioxide, methane and hydrogen sulphide. The effluent although clarified to a large extent, will still contain appreciable amount of dissolved and suspended putrescible organic solids and pathogens. Therefore the septic tank effluent disposal merits careful consideration. Because of the unsatisfactory quality of the effluent and also the difficulty in providing a proper effluent disposal system, septic tanks are recommended only for individual homes and small communities and institutions whose contributory population does not exceed 300. For larger communities, septic tanks may be adopted with appropriate effluent treatment and disposal facilities.

21.2.1 Design

Several experiments and performance evaluation studies, have established that only about 30% of the settled solids are anaerobically digested in a septic tank. In case of frequent desludging, which is necessary for satisfactory effluent quality, still lower digestion rates have been reported. All these studies have proved that when the septic tank is not desludged for a longer period i. e., more than the design period, substantial portion of solids escape with the effluent. Therefore for the septic tank to be an efficient suspended solids remover, it should be of sufficient capacity with proper inlet and outlet arrangements. It should be designed in such a way that the sludge can settle at the bottom and scum accumulates at the surface, while enough space is left in between, for the sewage to flow through without dislocating either the scum or the settled sludge. Normally sufficient capacity is provided to the extent that the accumulated sludge and scum occupy only half or maximum two-thirds the tank capacity, at the end of the design storage period.

Experience has shown that in order to provide sufficiently quiescent conditions for effective sedimentation of the suspended solids, the minimum liquid retention time should be 24 hours. Therefore, considering the volume required for sludge and scum accumulation, the septic tank may be designed for 1 to 2 days of wastewater retention.

The septic tanks are normally rectangular in shape and can either be a single tank or a double tank. In case of double tank, the effluent solids concentration is considerably lower and the first compartment is usually twice the size of the second. The liquid depth is 1-2 m and the length to breadth ratio is 2-3 to 1. Recommended sizes of septic tanks for individual households (upto 20 users) and for housing colonies (upto 300 users) are given below in tables 21.1 and 21.2 respectively:

TABLE 21.1

Recommended sizes of septic tank upto 20 users

No. of Users	Length (m)	Breadth (m)	Liquid depth (cleaning interval of) 2 years	3 years
5	1.5	0.75	1.0	1.05
10	2.0	0.90	1.0	1.40
15	2.0	0.90	1.3	2.00
20	2.3	1.10	1.3	1.80

Note 1: The capacities are recommended on the assumption that discharge from only WC will be treated in the septic tank.

Note 2: A provision of 300 mm should be made for free broad..

Note 3: The sizes of septic tank are based on certain assumption on peak discharges, as estimated in IS : 2470 (part 1) - 1985 and while choosing the size of septic tank exact calculations shall be made.

TABLE 21.2

Recommended sizes of septic tank for residential colonies

No. of Users	Length (m)	Breadth (m)	Liquid depth (cleaning interval of) 2 years	3 years
50	5.0	2.00	1.0	1.24
100	7.5	2.65	1.0	1.24
150	10.0	3.00	1.0	1.24
200	12.0	3.30	1.0	1.24
300	15.0	4.00	1.0	1.24

Note 1: A provision of 300 mm should be made for free board.

Note 2: The sizes of septic tank are based on certain assumptions on peak discharges, as estimated in IS : 2470 (Part 1) - 1985 and while choosing the size of septic tank exact calculations shall be made.

Note 3: For population over 100, the tank may be divided into independent parallel chambers of maintenance and cleaning.

21.2.2 Construction Details

The inlet and outlet should not be located at such levels where the sludge or scum is formed as otherwise, the force of water entering or leaving the tank will unduly disturb the sludge or scum. Further, to avoid short circulting, the inlet and outlet should be located as far away as possible from each other and at different levels. Baffles are generally provided at both inlet and outlet and should dip 25 to 30 cm into and project 15 cm above the liquid. The baffles should be placed at a distance of one fifth of the tank length from the mouth of the straight inlet pipe. The

invert of the outlet pipe should be placed at a level 5 to 7 cm below the invert level of inlet pipe. Baffled inlet will distribute the flow more evenly along the width of the tank and similarly a baffled outlet pipe will serve better than a tee-pipe.

For larger capacities, a two-compartment tank constructed with the partition wall at a distance of about two-thirds the length from the inlet gives a better performance than a single compartment tank. The two compartments should be interconnected about the sludge storage level by means of pipes or square openings of dia or side length respectively of not less than 75 mm.

Every septic tank should be provided with ventilation pipes, the top being covered with a suitable mosquito proof wire mesh. The height of the pipe should extend at least 2 m above the top of the highest building within a radius of 20 m.

Septic tanks may either be constructed in brick work, stone masonry or concrete cast in situ or pre-cast materials. Pre-cast household tank made of materials such as asbestos cement could also be used, provided they are watertight and possess adequate strength in handling and installing and bear the static earth and superimposed loads.

All septic tanks shall be provided with watertight covers of adequate strength . Access manholes of adequate size shall also be provided for purposes of inspection and desludging of tanks.

The floor of the tank should be of cement concrete and sloped towards the sludge outlet. Both the floor and side wall shall be plastered with cement mortar to render the surfaces smooth and to make them water tight. A typical two compartment septic tank is shown in Figure 21.1

21.2.3 Sludge withdrawal and Disposal

When sludge is drawn off from the bottom of the tank, at first the small quantity of sludge in the immediate vicinity of the outlet or suction pipe is withdrawn. This is followed by drawing off sewage, because the sludge, being only slightly heavier but much more viscous than the sewage, lies away from the point of outlet and the scum remains floating on the surface. With continued draw-off more sewage is removed, until finally only sludge and scum remain in the tank. These come off last, and then only if there is sufficient slope on the floor of the tank, force them to gravitate to the outlet. This is the reason for the slow bleeding-off of sludge from steep bottomed pyramidal sedimentation tanks and for desludging the septic by complete emptying. If septic tanks are disludged by partial removal only of the contents, they become more and more filled with sludge and scum, and the quality of the effluent deteriorates soon. For some reasons, desludging of septic tanks under hydrostatic head by means of a sludge pipe- collecting of sludge from the lowest point in the tank and discharging at a higher level, should be discouraged. As far as particable manual handling of sludge should be avoided. If possible particularly in case of densely populated large cities, mechanical vaccum tankers should be used by the municipal authorities to empty the septic tanks. Alternately, where space is not a constraint, a sludge pipe-with a delivery valve to draw the sludge as and when required, be installed at the bottom of the tank to empty its contents into a sump, for subsequent disposal on land or sent for further treatment. Spreading of sludge on the ground in the vicinity should not be allowed. Portable pumps may also be used for desludging in which case there will be no need for sludge pipe or sludge sump.

Yearly desludging of septic tank is desirable. But if it is not feasible or economical and if there is difficulty to find labour for desludging, small domestic tanks should be cleaned at least once in 1 to 2 years, provided the tank is not overloaded due to use by more than the number for which it is designed.

21.2.4 Secondary Treatment and Disposal of Effluent

The septic tank effluent will be malodorous, containing sizable portion of dissolved organic content and pathogenic organisms and hence need to be treated before its final, safe disposal. Depending upon the situation the size, treatment objective, resources available etc., the extent and type of secondary treatment facility can vary from the most conventional land disposal methods like soak pits or dispersion trenches to additional secondary biological treatment systems.

Normally the land disposal methods, are designed to achieve subsurface percolation or seepage into the soil. Satisfactory disposal therefore depends, to a great extent, on porosity and percolation characteristics of the soil. In addition, other factors, such as level of subsoil water table, the climatic conditions, presence of vegetation, aeration of solid and concentration of suspended solids in the effluent also influence the application of these methods. Soak pits or dispersion trenches can be adopted in all porous soils where soak percolation rate, as discussed in Appendix 21.1, is below 25 minutes per cm and the depth of water table is 2 m or more from the ground level. Dispersion trenches should be preferred in soils with percolation rates between 12 and 25 minutes if adequate land is available. In areas with higher water table, dispersion trenches should be located partly or fully above ground level, in a mound.

The subsoil dispersion system shall be at least 20 m away from any source of drinking water. It should also be as far as possible from the nearest dwellings but not close than 7 m to avoid any corrosive effect due to tank gases vented into atmosphere. Subsoil dispersion system is not recommended in limestone or crevice rock formations where they may be solution cavities which may convey the pollution to long distances and pollute water resources. In impervious soils such as dense clays and rocks, where percolation rate exceeds 25 minutes, adoption of upflow or reverse filters, trickling filters, subsurface sand filters or open sand filters followed by chlorination should be considered, particularly for larger installations.

In the absence of information relating to ground water or subsoil, subsurface explorations are necessary. Percolation tests as described in Appendex 21.2 determine the acceptability of the site and serve as the basis of design for liquid absorption. The total subsurface soil area required for soak pits or dispersion trenches is given by the empirical relation:

$$Q = 130 \quad vt \qquad (21\text{-}1)$$

Where

Q = maximum rate of effluent application in lpd/m² of leaching surface, and

t = Standard percolation rate for the soil in minutes

In calculating the effective leaching area required, only area of trench bottom in case of dispersion trenches and effective side wall area below the inlet level for soak pits should taken into account.

21.2.4.1 Soak Pits

Soak pits or seepage pits are cheap to construct and are extensively used. They need no media when lined or filled with rubble or brick bats. The pits may be of any regular shape, circular or square being more common. When water table is sufficiently below ground level, soak pits should be preferred only when land is limited or when a porous layer underlies an impervious layer at the top, which permits easier vertical downward flow than horizontal spread out as in the case of dispersion trenches. Minimum horizontal dimension of soak pit should be 1 m, the depth below the invert level or inlet pipe being at 1 m. The pit should be covered and the top raised above the adjacent ground to prevent damage by flooding.

21.2.4.2 Dispersion Trenches

Dispersion trenches consist of relatively narrow and shallow trenches about 0.5 to 1 m deep and 0.3 to 1 m wide excavated to a slight gradient of about 0,25%. Open joined earthenware or concrete pipes of 80 to 100 mm size are laid in the trenches over a bed of 15 to 25 cm of washed gravel or crushed stone. The top of pipes shall be covered by coarse gravel and crushed stone to a minimum depth of 15 cm and the balance depth of trench filled with excavated earth and finished with a mound above the ground level to prevent direct flooding of trench during rains. The effluent from the septic tank is led into a small distribution box from which several such trenches could radiate out. The total length of trench required shall be calculated from the Eq.(21.1) and the number of trenches worked out on the basis of a maximum length of 30 m for each trench and spaced not closer than 2 m apart. Parallel distribution should be such that a distribution box should be provided for 3 to 4 trenches.

21.2.4.3 Up-Flow anaerobic Filter

The up-flow filter can be successfully used for secondary treatment of septic tank effluent in areas where dense soil conditions, high water table and limited availability of land preclude soil absorption or the leaching system for effluent disposal. It is a submerged filter with stone media nad the septic tank effluent is introduced from the bottom. The microbial growth is retained on the stone media making possible higher loading rates and efficient digestion. The capacity of the unit is 0.04 to 0.05 m³ per capita or 1/3 to 1/2 the liquid capacity of the septic tank it serves. BOD removals of 70% can be expected. The effluent is clear and free from oder. This unit has several advantages viz. (a) a high degree of stabilization; (b) little sludge production; (c) low capital and operating cost; and (d) low loss of head in the filter (10 to 15 cms) in normal operation. The up-flow anaerobic filter can either be a separate unit or constructed as an extended part of septic tanks.

APPENDIX 21.1

Soil Percolation Test

To design a suitable soil absorption system for disposal of effluent from septic tanks, percolation tests shall be carried out, on the proposed site for location of the absorption system, in the following manner.

Six or more test holes spaced unformly over the proposed absorption field shall be made.

A square or circular hole with side width of diameter of 10 cm to 30 cm and vertical sides shall be dug or bored to the depth of the proposed absorption trench. The bottom and sides of the holes shall be carefully scratched with a sharp-pointed instrument to remove any smeared soil surfaces and to provide a natural soil interface into which water may percolate. The holes shall be filled for a depth of 5 cm with loose material to protect the bottom from scouring and settling.

Before the actual readings for percolation tests are taken, it is necessary to ensure that the soil is given ample opportunity to swell and approach the condition it will be in during the wettest season of the year. This is done by pouring water in the hole upto a minimum depth of 30 cm over the gravel and allowed to soak for 24 hours. If the water remains in the test hole after the overnight swelling period, the depth of water shall be adjusted to 15 cm over the gravel. Then from a fixed reference point, the drop in water level shall be noted over a 30 min. period. This drop shall be used to calculate the percolation rate.

If no water remains in the hole, at the end of 30 min. period water shall be added to bring the depth of the water in hole 15 cm over the gravel. From a fixed reference point, the drop in water level shall be measured at 30 min. intevals for 4 hours, refilling to 15 cm level over the gravel as necessary. The drop that occures during the final 30 min. period shall be used to calculate the percolation rate. The drop during the earlier periods provide infomation for the possible modification of the procedure to suit local circumstances.

In sandy soils or other porous soils in which the first 15 cm of water seeps away in less than 30 minutes after overnight swelling period, the time interval between measurements shall be taken as 10 minutes and the test run for one hour. The drop that occurs in the final 10 minutes shall be used to calculate the percolation rate.

Based on the final drop, the percolation rate, which is the time in minutes required for water to fall 1 cm. shall be calculated.

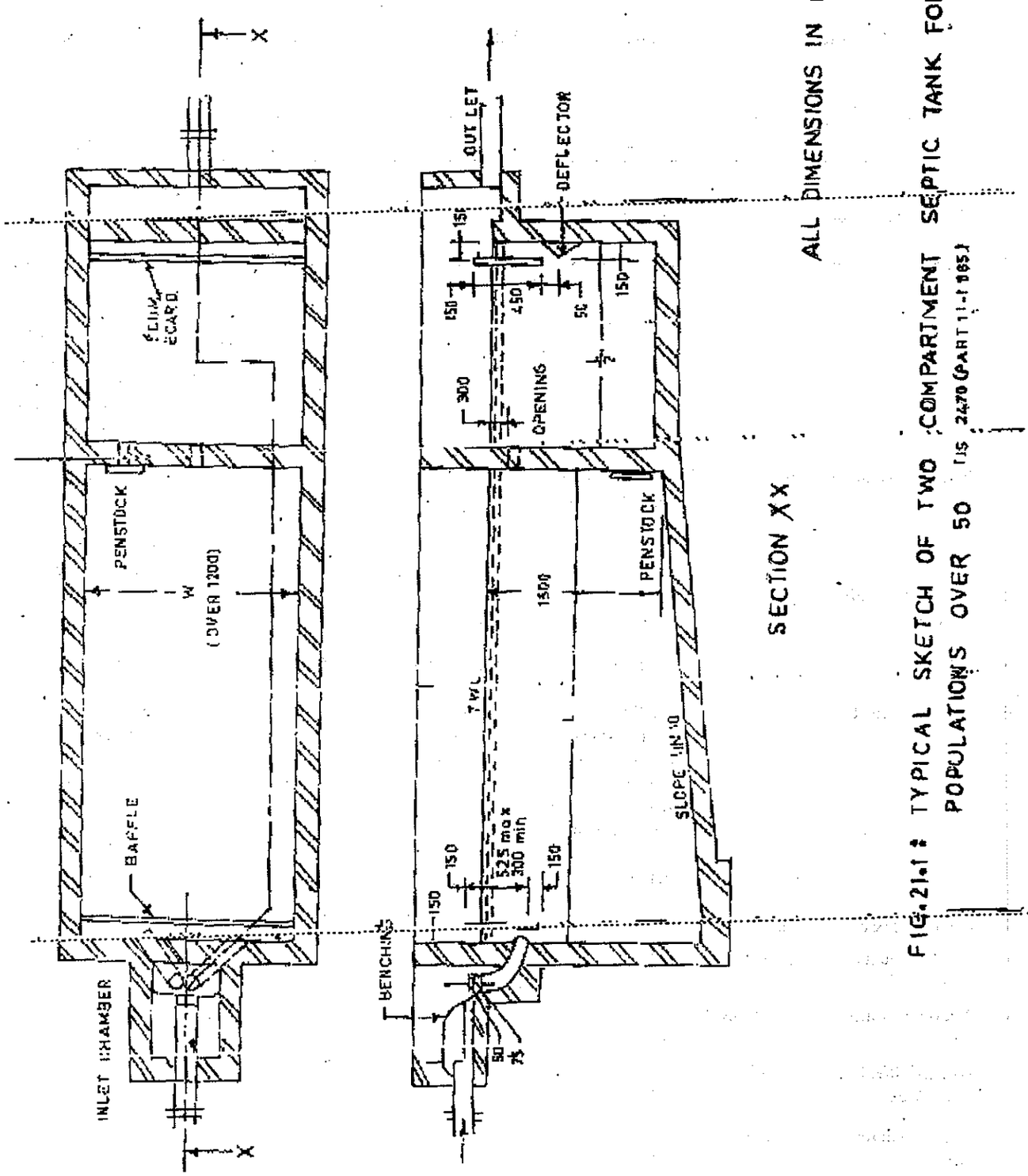


FIG. 21.1 : TYPICAL SKETCH OF TWO COMPARTMENT SEPTIC TANK FOR POPULATIONS OVER 50 (IS 2470 (PART II)-1985)

ANNEXURE - 3

Ref: Rule 6 (Annexure II) of 'The Environment (Protection) Rules, 1986

General Standards for Discharge of effluents

Sl. No.	Parameter	Standards			
		Inland surface water	Public sewers	Land for Irrigation	Marine coastal areas
1	2	3			
		(a)	(b)	(c)	(d)
1.	Colour and odour	See Note 1	—	See Note 1	See Note 1
2.	Suspended solids, mg/l, Max	100	600	200	(a) For process waste water-100 (b) For cooling water effluent-10 per cent above total suspended matter of influent cooling water.
3.	Particle size of suspended solids.	shall pass 850 micron IS Sieve			(a) Floatable solids, Max 3 mm (d) Settleable solids Max 850 microns.
4.	Dissolved solids (inorganic), mg/a, max.	2100	2100	2100	—
5.	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
6.	Temperature °C, Max	Shall not exceed 40 in any section of the stream within 15 meters down stream from the effluent outlet	45 at the point of discharge	—	45 at the point of discharge
7.	Oil and grease, mg/1, max	10	20	10	20
8.	Total residual chlorine, mg/1, Max.	1.0	—	—	1.0
9.	Ammonical nitrogen (as N), mg/1, Max.	50	50	—	50
10.	Total Kjeldahl nitrogen (as N), mg/1, Max.	100	—	—	100
11.	Free Ammonia (as NH_3), mg/1, Max.	5.0	—	—	5.0
12.	Biochemical oxygen demand (5 days at 20°C) Max.	30	350	100	100

[1] Schedule II inserted vide G.S.R. 919(E) dt. 12-9-88, published in the Gazette No. 488 dt. 12-9-88.

Sl. No.	Parameter	Standards			
		Inland surface water	Public sewers	Land for Irrigation	Marine coastal areas
1	2			3	
		(a)	(b)	(c)	(d)
13.	Chemical Oxygen demand, mg/1, Max.	250	—	—	250
14.	Arsenic (as As), mg/1., Max.	0.2	0.2	0.2	0.2
15.	Mercury (As Hg) mg/1, Max.	0.01	0.01	—	0.01
16.	Lead (as Pb), mg/1, Max.	0.1	1.0	—	1.0
17.	Cadmium (as Cd), mg/1, Max.	2.0	1.0	—	2.0
18.	Hexavalent chromium (as Cr+6) mg/1, Max.	0.1	2.0	—	1.0
19.	Total chromium (as Cr), mg/1, Max.	2.0	2.0	—	2.0
20.	Copper (as Cu), mg/1, Max.	3.0	3.0	—	3.0
21.	Zinc (as Zn), mg/1, Max.	5.0	15	—	15
22.	Selenium (as Se), mg/1, Max.	0.05	0.05	—	0.05
23.	Nickel (as Ni), mg/1, Max.	3.0	3.0	—	5.0
24.	Boron (as B), mg/1 Max.	2.0	2.0	2.0	—
25.	Percent sodium, Max.	—	60	60	—
26.	Residual sodium carbonate, mg/1, Max.	—	—	5.0	—
27.	Cynide (as CN), mg/1, Max.	0.2	2.0	0.2	0.2
28.	Chloride (as Cl), mg/1, Max.	1000	1000	600	—
29.	Fluoride (as F), mg/1, Max.	2.0	15	—	15
30.	Dissolved Phosphates (as P), mg/1, Max.	5.0	—	—	—
31.	Sulphate (as SO^4), mg/1, Max.	1000	1000	1000	—
32.	Sulphide (as S), mg/1, Max.	2.0	—	—	5.0
33.	Pesticides	Absent	Absent	Absent	Absent
34.	Phenolic compounds (as C_6H_5OH) mg/1, Max.	1.0	5.0	—	5.0
35.	Radioactive materials:				
	(a) Alpha emitters MC/ml., Max.	10^{-7}	10^{-7}	10^{-8}	10^{-7}
	(b) Beta emitters uc/ml., Max.	10^{-6}	10^{-6}	10^{-7}	10^{-6}

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